Cholestyramine Resin

C

1 Nonproprietary Names

PhEur: Colestyramine

USP–NF: Cholestyramine Resin

2 Synonyms

Cholestyramine; colestyraminum; *DUOLITE AP143*; *Purolite A430MR*.

3 Chemical Name and CAS Registry Number

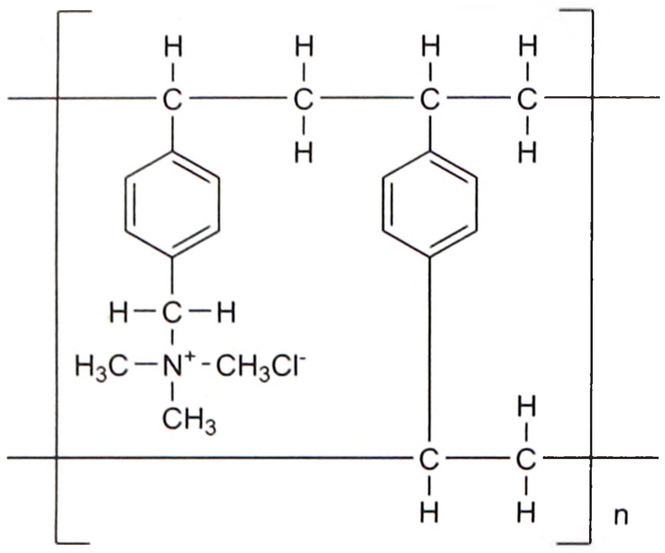
Cholestyramine [11041-12-6]

4 Empirical Formula and Molecular Weight

Cholestyramine resin is a strongly basic anion exchange-resin in the chloride form, consisting of styrene-divinylbenzene copolymer with quaternary ammonium functional groups.

Cholestyramine resin is a polymer of infinite molecular weight. The infinite molecular weight is due to the cross-linked structure of the styrene-divinylbenzene copolymer. The cross-linking nature of styrene and divinylbenzene leads to one large polymer molecule (tri-dimensional matrix). Due to this chemistry, an average molecular weight determination is not possible.

5 Structural Formula



6 Functional Category

Complexing agent; modified-release agent; solubilizing agent; taste-masking agent.

7 Applications in Pharmaceutical Formulation or Technology

Cholestyramine resin is used as an excipient to form a complex ('resinate') with molecules to modify the release profile, and to improve solubility and taste-masking. The chloride ion is exchanged with the anionic drug, which is released by further exchange with anions in the gastrointestinal tract.[1] It has also been identified for uses as an abuse deterrent, to increase drug stability, and to eliminate polymorphism.[2]

Typical drug loadings of cholestyramine resin range between 5–50% of the total exchange capacity. The amount of drug loaded is dependent on factors such as selectivity of exchange resin for the drug, concentration of the drug for exchange, or competition from anions in the exchange solution. The rate of loading will be influenced by the drug size and the extent of resin swelling.[1] The drug can be loaded onto the resin by a batch or continuous column process, however batch equilibration is preferred when the resin is a finely divided powder. It may be necessary to repeat the loading stage two or more times to achieve maximum drug loading.[1] High drug charge density, low drug molecular weight, and high concentration of the drug with few competing anions are properties that favor high loading capacity. Drug release *in vivo* is controlled by the diffusion rate of the drug from the resin, the selectivity of the drug for the resin, and concentration of electrolytes in the exchange environment.[1]

Diclofenac potassium–cholestyramine resin complexes have been shown to improve the onset and length of action of the drug, and drug tolerability.[3]

See also The Selection of Excipients for Oral Solid Dosage Forms.

8 Description

Cholestyramine resin occurs as a white or almost white, hygroscopic, fine powder. It is odorless or has not more than a slight amine-like odor.

9 Pharmacopeial Specifications

See Table I.

Table I: Pharmacopeial specifications for cholestyramine resin.

Test	USP 40–NF 35 S1	PhEur 9.2
Identification	+	+
pH	4.0–6.0	4.0–6.0
Loss on drying	≤12.0%	≤12%
Residue on ignition	≤0.1%	—
Sulfated ash	—	≤0.1%
Heavy metals	0.002%	—
Dialyzable quaternary amines	≤0.05%	≤500 ppm
Chloride content (dried basis)	13.0–17.0%	13.0–17.0%
Exchange capacity (dried basis)	1.8–2.2 g/g	1.8–2.2 g/g
Styrene	—	≤1 ppm

10 Typical Properties

Autoignition temperature >500°C[4]
Bulk density 500 g/L[5]
Flash point >93.3°C (closed cup)[4]
Moisture content 12%
Relative density 1.15–1.20[6]
Solubility Insoluble in water, alcohol, benzene, chloroform, and ether.[6,7]
Specific gravity 1.08[4]
Spectroscopy IR spectrum *see* Figure 1.

11 Stability and Storage Conditions

Cholestyramine resin is stable for at least 2 years. It is recommended to store the product in its original air-tight packaging, and under normal storage conditions, away from heat, light or moisture.

12 Incompatibilities

Cholestyramine resin is incompatible with oxidising agents, which may lead to degradation of the ion exchange resin. Strong oxidising agents and nitric acid may cause explosive reactions.